Cost Analyses in Decision Making

PMO 529

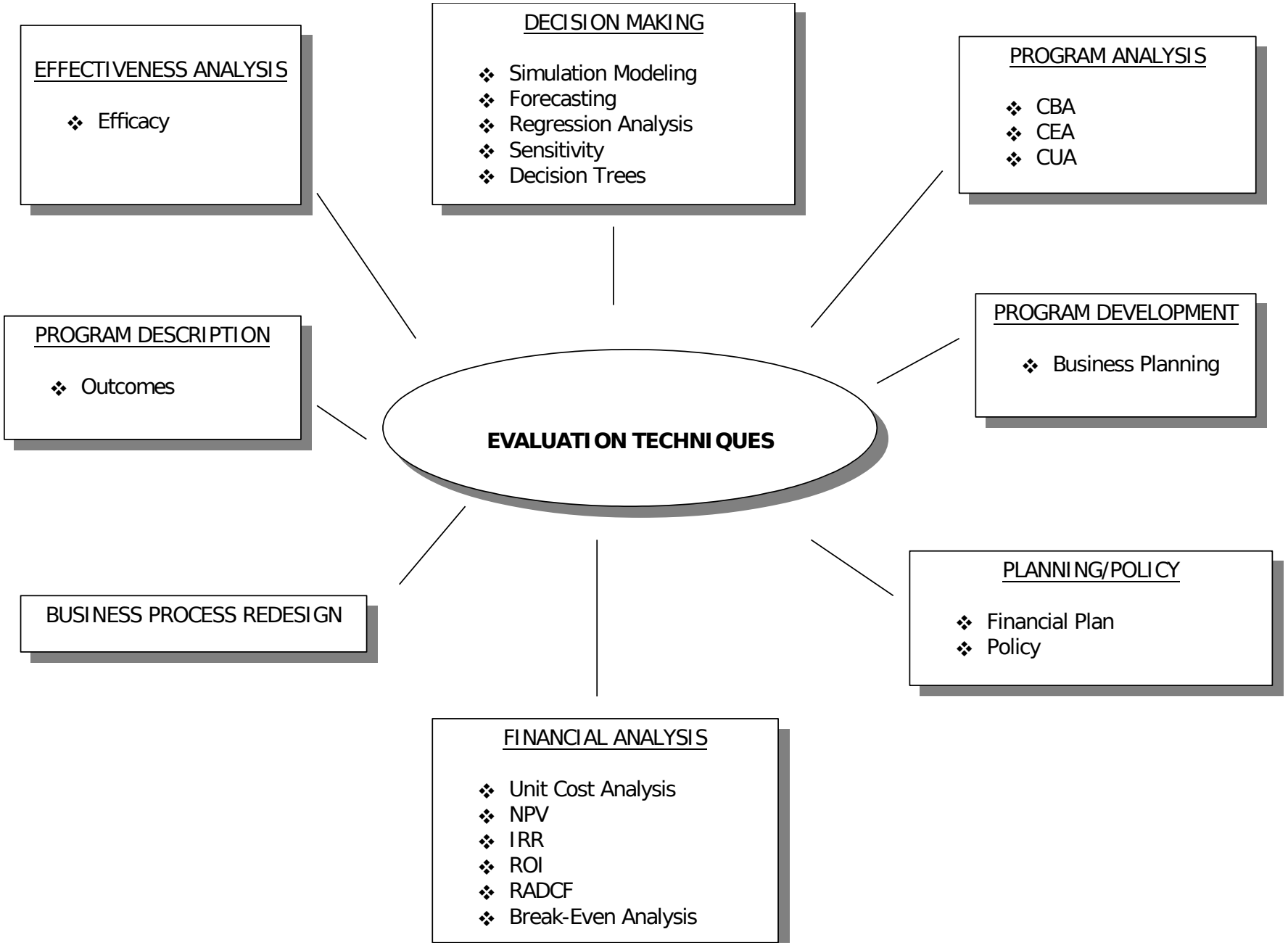
24 April 2003

Cost Analyses
Planning

- ✓ Strategic Planning
  - Capital availability
- ✓ Financial Planning
  - Investment opportunities
  - Budgeting
  - Pricing
- ✓ Business Planning
  - Project description
  - Strategic analysis
  - Market assessment
  - Financial (and perhaps benefit) analysis
  - Implementation plan
  - Exit strategy

Cost Analyses
Decision Making

- ✓ Evaluating financial impact of alternatives
  - ➢ Policies, programs
  - ➢ ROI, ROE, ROA
- ✓ Changing plans, goals, and strategies
  - ➢ Capital investment decisions
- ✓ Changes in operating processes
  - ➢ Business process reengineering
- ✓ Measuring and rewarding performance


EFFECTIVENESS ANALYSIS
Efficacy
DECISION MAKING
Simulation Modeling
Forecasting
Regression Analysis
Sensitivity
Decision Trees
PROGRAM ANALYSIS
CBA
CEA
CUA
PROGRAM DESCRIPTION
Outcomes
EVALUATION TECHNIQUES
PROGRAM DEVELOPMENT
Business Planning
BUSINESS PROCESS REDESIGN
PLANNING/POLICY
Financial Plan
Policy
FINANCIAL ANALYSIS
Unit Cost Analysis
NPV
IRR
ROI
RADCF
Break-Even Analysis

Using Cost Analysis Techniques

Comparing Health Care Alternatives

	Outcomes	Cost Only	Outcomes and Costs
Single alternative	Outcome description	Cost description	CBA
Two or more alternatives	Efficacy or effectiveness evaluation	Financial Analysis CBA	CBA CEA Cost-utility Cost-minimization

Using Cost Analysis Techniques

Comparing Health Care Alternatives

- ✓ Financial analyses
- ✓ Cost-benefit analyses
- ✓ Cost-effectiveness analyses

Financial Analysis Methods

- ✓ Net present value (NPV)
- ✓ Internal rate of return (IRR)
- ✓ Discounted payback method
- ✓ Return on investment (ROI)
- ✓ High, low, expected cost impact
- ✓ Risk adjusted discounted cash flow (RADCF)

Refer to Financial Analysis Notes

NPV Analysis

"a dollar today is worth more than a dollar tomorrow"

- ✓ Upfront cost estimate
- ✓ Free cash flow forecast
- ✓ Cost of capital estimate
  - ➢ equity method
  - ➢ debt market method
  - ➢ risk analysis method
- ✓ Terminal value estimate

Comparing Health Care Alternatives

- ✓ Financial analyses
- ✓ Cost-benefit analyses
- ✓ Cost-effectiveness analyses

Cost-Benefit Analysis

Uses

- ✓ Costs and benefits assigned monetary value
  - ➢ Qualitative and quantitative benefits derived
  - ➢ Products or outcomes of alternatives may be considerably different
- ✓ Non-financial benefits can be readily ascertained or estimated
- ✓ Decision based on cost

Cost-Benefit Analysis
Steps

- ✓ Determine purpose of the analysis
  - ➢ Identify alternatives/options
  - ➢ Define scope
- ✓ Assess variables involved
  - ➢ Outputs derived, risks, sensitivity
  - ➢ Costs involved, financing available
- ✓ Develop a model for financial analysis
- ✓ Develop outcomes and other evaluation criteria
  - ➢ Select based on acceptable outcomes/risk/cost relationship
- ✓ Create implementation timetable

Cost-Benefit Analysis
Variables

- ✓ Cost variables
  manpower, supplies, equip, travel, services, capital investments

- ✓ Other variables
  - demographics
  - workload
  - info support
  - inflation
  - internal capabilities
  - external assessment
  - start up costs
  - learning curve

- ✓ Outcome variables
  - desired clinical outcomes
  - quality of care
  - community relations
  - access
  - patient satisfaction
  - morale

Cost-Benefit Analysis
Definitions

Average or unit cost

Breakeven point

Cost avoidance

Cost savings

Direct costs

Fixed costs

Full costing

Incremental cost

Indirect costs

Marginal costs

Opportunity costs

Overhead costs

Relevant cost/ range

Semivariable costs

Sunk costs

Variable costs

Cost-Benefit Analysis

Education Outreach

Medicaid risk contractor monitors hospitalization rates determines Medicaid mothers have a disproportionate share of LBW newborns.

Identify Problem

Problem determined to be educational, rather than access, related to understanding by Medicaid mothers of the importance of prenatal care.

Define Problem

Reviewed epidemiologic studies linking prenatal education with newborn weight. 2 educational outreach program alternatives identified.

Identify alternatives

Key evaluation measures - 5 mortality rates: infant, neonatal, postneonatal, perinatal and maternal.

Set evaluation criteria

Selected program with the largest projected impact on mortality rate costs per dollar spent.

Select

Comparing Health Care Alternatives

- ✓ Financial analyses
- ✓ Cost-benefit analyses
- ✓ Cost-effectiveness analyses

Cost-Effectiveness Analysis

Uses

- ✓ Comparing health intervention strategies
- ✓ Allocating scarce resources
  - ➢ Oregon Medicaid experience
- ✓ Health benefit plan coverage determination
- ✓ Technology Assessment
  - ➢ Government policy (Federal, State)
  - ➢ Adoption of new drugs, equipment, etc.

Cost-Effectiveness Analysis

When to use…

Effectiveness	COST: New Strategy Costs *MORE*	COST: New Strategy Costs *LESS*
New Strategy is *MORE* Effective	CEA Relevant	Adopt New Strategy
New Strategy is *LESS* Effective	New Strategy is "dominated"	CEA Relevant

Cost-Effectiveness Analysis

When to use…clinical decisions

1. Used for a medical condition
2. Sufficient evidence to draw conclusions about the effects on health outcomes
3. Evidence that the intervention will produce the intended effect
4. Beneficial effects outweigh the harmful effects
5. Intervention is the most cost effective method available to address the medical condition

Cost-Effectiveness Analyses
Definition

- ✓ Monetary costs to prevent one illness, disability, or death compared across treatment options
  - ➢ Compare interventions aimed at the same outcome
- ✓ How are the results expressed?
  - ➢ CE Ratio – Ratio of marginal cost to marginal effectiveness
    - Dollar amount (cost) to prevent one unwanted outcome, or cost per year of life saved
  - ➢ Number Needed to Treat (NNT)

Cost-Effectiveness Analyses

Expressed as a ratio

CE ratio is equal to:

$$\frac{Cost_{\text{new strategy}} - Cost_{\text{current practice}}}{Effect_{\text{new strategy}} - Effect_{\text{current practice}}}$$

Cost-Effectiveness Analyses

Expressed as NNT

- ✓ NNT – Number-Needed-to-Treat

  NNT = 1/RD

  Often expressed in “person years of treatment”

- ✓ RD – Risk Difference

  Difference between the rate of outcomes in a group receiving a certain service or treatment, and the rate among those receiving a comparative (or no) treatment

Cost-Effectiveness Analysis – Example

Children with headache suspected of having a brain tumor – high, intermediate, low risk groups

3 diagnostic strategies considered:

1. MRI
2. CT followed by MRI for positive results
3. No neuroimaging with close clinical follow up

Considered:

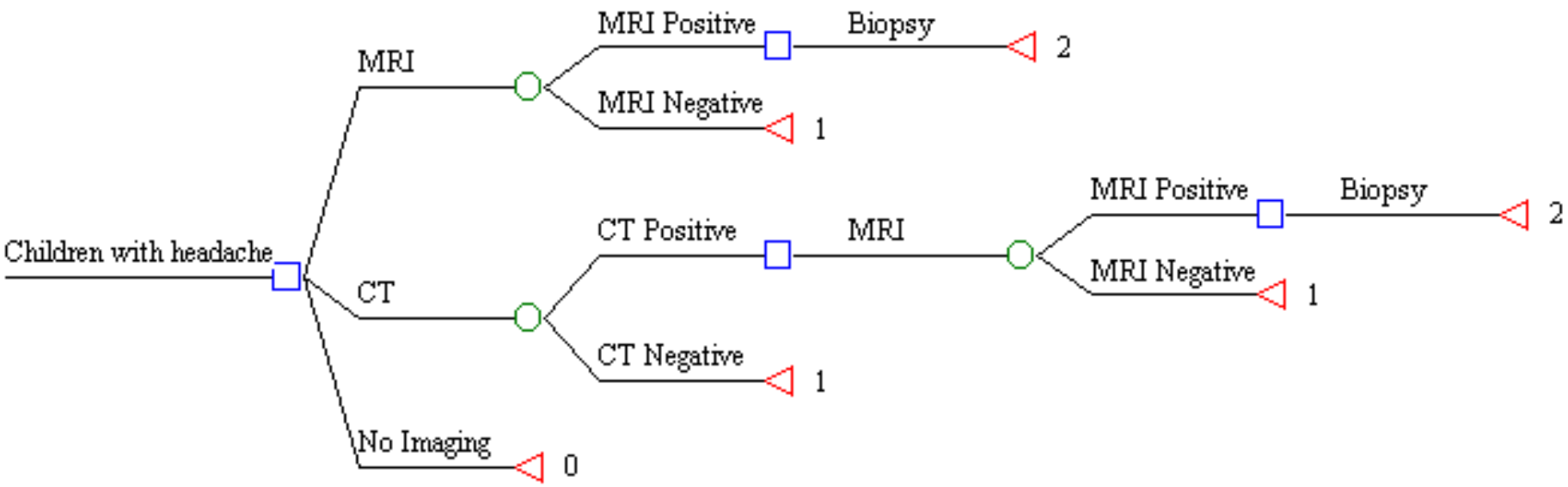
Risk group prior probability
MRI/ CT sensitivity and specificity
Tumor survival
Progression rates
Cost per strategy

Outcomes based upon:

QALY gained

Cost-Effectiveness Analysis

Children with headache



Cost-Effectiveness Analysis
Children with headache (ratio)

Results:

Low risk. Chronic nonmigraine headaches >6 months duration. Probability of brain tumor 0.01%. No imaging strategy was less costly and more effective.

Intermediate risk. Migraine headache, normal neurologic exam, probability of brain tumor 0.04%. CT-MRI most effective strategy, cost >$1M per QALY.

High risk. Headache <6 months duration, abnormal neurologic exam, probability of brain tumor 4%. MRI strategy most effective, cost $113,800 per QALY.

Cost-Effectiveness Analysis

Heart Attacks (NNT)

- ✓ Rate of heart attack
  - 20 per 1,000 - new treatment
  - 30 per 1,000 – standard treatment
- ✓ RD = 10 per 1,000
- ✓ NNT = 1,000/10 =100
  - ➢ 100 patients need to get the new treatment to prevent one heart attack
    - 100 persons need to be treated for one year
    - 10 persons need to be treated for 10 years

Cost-Effectiveness Analysis

Cholesterol Screening (NNT)

- ✓ 35 yo female evaluated
  - ➢ Family history (father) - heart disease
  - ➢ Generally healthy, no other CV risk factors, non smoker
    - Elevated serum cholesterol, same as for older sibling
    - Physical exam normal
  - ➢ Older (50 yo male) sibling with CV risk factors takes “XYZ” Rx med to lower serum cholesterol

- ✓ Evidence base?
  - ➢ Lowering serum cholesterol prevents coronary disease and stroke
  - ➢ Dietary counseling yields a 3-6% reduction in total & LDL cholesterol
  - ➢ Most effective cholesterol-lowering drugs (“statins”) lower total and LDL cholesterol by 20-50%
  - ➢ Cost of these drugs is $35 to $100 per month

Cost-Effectiveness Analysis

Cholesterol Screening (NNT)

- ✓ What is the NNT?
  - 5yr NNT is 1,000 (to prevent one heart attack, you'd have to treat 1,000 younger women with XYZ for 5 years).
    - At a $35 cost per month, drug cost alone would be $2.1M.
  - 5yr NNT for her sibling is 35
    - Associated drug cost of $74,000
- ✓ Decision not to treat with XYZ
  - Attributable difference in risk - clinical trials that demonstrated "XYZ" Rx med reduces heart attack rates did not include women in their thirties
  - Cost effectiveness

Cost-Effectiveness Analyses
What is Needed?

- ✓ Evidence base for outcomes – especially long-term outcomes for chronic illness
  - ➢ Population epidemiology
  - ➢ Clinical epidemiology
- ✓ More patient-oriented research rather then disease-orientation (biophysical mechanisms)
  - ➢ Addresses QOL

Cost-Effectiveness Analyses
Concerns

- ✓ **No standard methodology**
  - ➢ 1996 Panel on Cost-Effectiveness in Health and Medicine (Reference case)
- ✓ **Societal, population-based perspective**
  - ➢ Health care delivered on an individual basis
  - ➢ Benefit/risk for different segments of population, example
    - Folic acid supplementation
      - Neural tube defects vs. pernicious anemia in the elderly
- ✓ **QALYs as the measure of health effect**
    - Equal? no matter who gains them, or when during a life span?
- ✓ **No cut off between cost-effective and cost-ineffective**
- ✓ **Does monetizing health introduce an ethical issue?**

You choose the method!

As a state Medicaid agency health official, you have been asked to provide a recommendation regarding formulary coverage of a prescription drug used to treat hyperlipidemia in children.

There is significant cost difference in the three drugs that are commonly used, and each varies in its effectiveness in reducing blood lipids. What cost analysis method would most likely be appropriate in this situation?

You choose the method!

You are the director of a busy ambulatory clinic, located in a small town, about 25 miles from your affiliated community hospital. You would like to convince your board that your clinic should expand its services to include ambulatory surgical capability.

Initial cost proposals indicate that approximately $3M would be required. You are currently gathering the demographic, workload and other data. What cost analysis method would most likely be appropriate in this situation?

You choose the method!

As the director of a public health clinic providing services primarily to low-income seniors, you have limited resources and only $300K to allocate to senior health programs.

Your staff has proposed three alternative programs, all of which would fill critical needs for your population: pneumonia vaccination, hypertension screening, and an educational program for care providers of Alzheimer's patients. What cost analysis method would most likely be appropriate in this situation?

Questions?